Manitoba Agriculture

Canola (Rapeseed) Production In Manitoba

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Canola Production in Manitoba

The first commercial crop of canola/rapeseed in Manitoba was produced in 1943 and totalled 600 ha (1500 acres).

In recent years canola/rapeseed has become Manitoba's most important oilseed crop. In 1979, 546,000 ha (1,350,000 acres) were seeded, and the harvested crop was valued at $151 million or 14 per cent of the province's total crop production. Production decreased in 1981 to 243,000 ha (600,000 acres), but has since rebounded with a record 672,000 ha (1,550,000 acres) seeded in 1988.

To qualify as a true "canola" type, varieties must contain less than two per cent erucic acid in the seed, and less than 30 micromoles per gram of glucosinolates in the meal. Eventually, the industry plans to tighten these standards to one per cent and 15 micromoles to ensure Canadian seed, oil and meal maintain their competitive edge. Such varieties are also referred to as a "double low."

The "canola" name was registered in 1979 by the Western Canadian Oilseed Crushers Association. On August 1, 1987 the name was officially adopted by the Canadian Grain Commission following inclusion of the term in the Canada Grain Act.

The switch to canola varieties has opened many markets for canola seed and oil, both domestically and in export markets such as Japan (Canada's major export customer), the U.S. and Mexico.

Canola oil has the lowest saturated fat content of all vegetable oils and many nutritionists consider it the premium oil for salads, cooking and other food uses. In 1987 a brand of 100 per cent canola oil was named "Food Product of the Year" by the American Health Foundation.

The by-product of crushing canola seed for oil is the meal. Canola meal contains about 35 per cent protein and is an excellent source of protein in animal feeds.

CANOLA VARIETY DEVELOPMENT

Canola varieties of rapeseed were first developed in Western Canada with the introduction of the brassica napus variety Tower in 1974. Regent, a variety higher in yield and oil content, was registered in 1977. Both early canola varieties were developed by Dr. Baldur Stefansson at the University of Manitoba.

In 1982 the variety Westar was registered. Developed at Agriculture Canada, Saskatoon, Westar was higher yielding than Regent and became the dominant B. napus ("Argentine") variety in Manitoba.

Another significant advance was the introduction of the first triazine tolerant (TT) variety, OAC Triton, in 1984. This variety permitted canola production on corn land which had been treated with atrazine and enabled farmers to spray for wild mustard without damaging the crop. Subsequent TT varieties have shown improved agronomic performance.

Several new canola varieties have recently been registered, including a number from private breeding programs, particularly in Europe. Consult the latest edition of Manitoba Agriculture publication "Field Crop Variety Recommendations for Manitoba" for information on the latest varieties.

Canola varieties of the earlier maturing "Polish" Brassica campestris (or B. rapa) types were also developed in the late 1970s. Candle (1977) and the higher yielding Tobin (1982) were both developed by Agriculture Canada, Saskatoon. In recent years, several new varieties of Polish type canola have been released.

Other new developments in canola breeding include the first hybrid canola, Hyola 40, which was registered in 1989. Varieties with modified fatty acid composition, such as low linolenic acid, are also being tested for market acceptance.

High erucic acid rapeseed is still produced in Manitoba, but for a specialized industrial market. To ensure delivery opportunities for rapeseed, the crop should be grown under contract.

ADAPTATION OF CANOLA

Canola grows well on most soil types, but is best suited to loam soils that do not crust severely or hamper seedling emergence. Good yields may also be obtained in peat or heavy clay soils, although obtaining optimum seedbed conditions may be difficult. Canola is well adapted to wetter areas but does not tolerate waterlogged conditions.

On any soil type, dry conditions at seeding time can result in uneven emergence of the shallow seeded crop. Canola does not tolerate hot dry conditions during the flowering period and has moderate tolerance to soil salinity.

CANOLA IN CROP ROTATIONS

Because canola is susceptible to several diseases, it should not be grown more frequently than one in four years on the same field. The major diseases of canola are:

- seedling blights and root rots (Fusarium, Rhizoctonia, Pythium)
- white stem rot (Sclerotinia)
- blackleg (Leptosphaeria)
- white rust-staghead (Albugo)
- black spot (Alternaria)
- downy mildew (Peronospora)

The following management practices also help reduce disease levels:

- use disease-free seed.
- treat seed to control seeding blights and root rots, and slow the spread of blackleg.
- do not seed canola adjacent to fields that produced canola the previous two years.
- thoroughly control weeds in each year of the four-year rotation. Pay particular attention to wild

mustard and other cruciferous weeds which are susceptible to canola diseases.

- avoid sclerotinia-susceptible crops in the rotation such as lentils, peas, field beans, fababeans, soybeans, sunflowers, mustard, safflower and forage legumes.

NOTE ON BLACKLEG

Blackleg disease has been identified on an increasing number of fields in Manitoba and has caused devastating losses in some areas. All canola seed must be treated to help prevent the introduction of this disease into new areas. The practice of strict crop rotations is essential if serious losses from blackleg are to be prevented.

No fully resistant blackleg varieties are available, although some recently registered varieties have improved resistance. However, since these varieties are not fully resistant, they do not prevent the spread of the disease.

If blackleg is identified in a canola field, the field should not be seeded to canola again for at least four to five years. Stubble from the infected crop should be kept well buried. Once the disease has been introduced into the soil, seed treatments against blackleg are not effective.

CANOLA AND SUGAR BEETS

Canola should not be grown within two years following sugar beets. Canola can act as a host of the sugar beet nematode which can cause serious losses in subsequent sugar beet crops.

Bees pollinating canola crop

VARIETIES

Details on the performance of varieties recommended in Manitoba are published yearly in Manitoba Agriculture's "Field Crop Variety Recommendation Guide." Generally, two years of adaptation trials are required before a newly registered variety is recommended for production in Manitoba.

SEEDING

Use of certified seed is strongly recommended. Certified seed is field inspected and provides the best assurance of high genetic purity and quality. The seed has been tested before sealing to ensure high germination, low

erucic acid and glucosinolate levels, and minimal weed seed content.

It is also strongly recommended that seed be tested for the virulent strain of blackleg. This serious disease is introduced into new areas through contaminated seed, so producers should only purchase seed that is blackleg free.

SEEDBED PREPARATION AND PLANTING

The seedbed for canola must be prepared carefully to ensure rapid and even emergence. An optimum seedbed is reasonably level, uniform, well-packed (before seeding), free from weeds, warm, slightly lumpy on the surface, but moist throughout its depth. The soil surface should have a good granular structure, but enough larger lumps to help reduce soil erosion.

Soil firmness is important but packing after seeding is generally detrimental.

DATE OF SEEDING

Canola should be seeded early to reduce the threat of fall frosts and subsequent grade loss. However, seedbeds should be warm — at least 10°C — for rapid emergence.

B. napus (Argentine) types can be sown until the end of May. To avoid the threat of frost and for all later seedings (to mid-June), B. campestris (Polish) varieties should be sown.

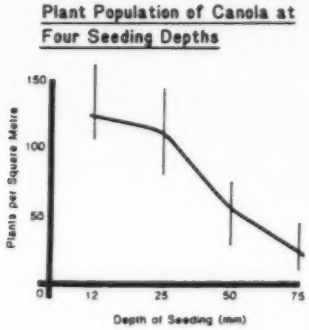
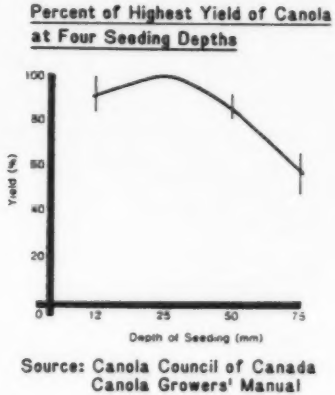


figure 1



Source: Canola Council of Canada
Canola Growers' Manual

figure 2

A yield reduction of about 10 per cent per week may be expected for crops seeded beyond the third week of May.

DEPTH OF SEEDING

Seeding depth is critical for canola because it significantly affects seedling vigour and plant population. A seeding depth of 12 to 25 cm (1/2 to 1 in.) is recommended.

The press drill (either the double disc, or in heavier trash, the hoe) is the best machine for seeding canola into most soil types. It provides consistent depth and leaves the soil firmly pressed around the small canola seeds.

Good results can be obtained with other seeding equipment. Air seeders can work well, although the consistency of seeding depth may be a problem. Discer seeders lack precise depth control, and tend to leave a rougher surface which requires additional packing. Depth of seeding is critical for the small seeds of canola, as it significantly affects seedling vigour and plant population.

The effect of seeding depth on plant population and yield is illustrated in figures 1 and 2.

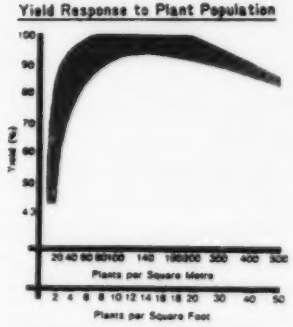
PLANT POPULATION

The optimum plant population for maximum yields in canola is between 80 and 180 plant/m^2 (7 and 17 plants/sq. ft.). Below 80 plants, compensation for the low population takes place through increased branching. Eventually, yields can suffer with plant populations below 60 plants/m^2 (5.5 plants/sq. ft.).

This ability to compensate for a lower plant population is beneficial following plant loss due to frost, hail, disease or insects, because severely thinned stands may still develop to produce satisfactory yields. However the weed level in a thin stand is critical because increased weed competition may prevent adequate compensatory growth and reduce yields.

If the crop is injured, producers should be patient before re-seeding. Figure 3 illustrates how low the population can drop before significant yield losses occur. It should be noted that subsequent weather conditions also affect the recovery of a thinned stand.

Canola can withstand several degrees of frost. However, the conditions under which freezing temperatures are experienced will have different effects. Several nights of



Source: Canola Council of Canada
Canola Growers' Manual

figure 3

close to freezing temperatures will lead to hardening which may protect plants from damage on a subsequent night with several degrees of frost. On the other hand, a night of frost without prior hardening may cause significant damage at only a few degrees below zero.

If frost is sufficient to blacken the leaves, wait four to five days to determine the extent of the damage. If the growing point is still green, the plant will recover. Yields from such crops may well be superior to those from re-seeded crops.

RATES OF SEEDING

The following are the recommended seeding rates for canola:

	kg/ha	(lb./acre)
Argentine types	6 to 8	(5 to 7)
Polish types	5 to 7	(4 to 6)

The higher rates should be used when seedling into a less than optimum seedbed, or with seeding equipment that places the seed at variable depths, such as a discer.

If seeding accurately at the lower rates is difficult, seed can be mixed with granular insecticide on a 50:50 basis (seed is often sold this way), or with fertilizer (e.g. 11-52-0) through the fertilizer attachment. Canola can also be planted through a grass seeder attachment.

A third option which assists seed rate accuracy is to use coated seed. This product includes a coating impregnated with insecticide and fungicide, and a small amount of phosphate. Results are variable on the benefits of coated seed, and seem to depend to a large degree on soil and climatic conditions. Check the seed drill manual or information from the seed coating company on the correct adjustments.

POLLINATION OF CANOLA USING HONEY BEES

Canola benefits from insect pollination, especially Polish varieties which are almost wholly cross-pollinated. Argentine varieties are about 70% self-pollinated, so the advantage from insect pollination is less in these varieties. Honey bees are attracted to both species because of the high sugar concentration of the nectar (43 to 65 %).

When honey bees pollinate canola, the seed is set earlier, it matures more uniformly and germination of the seed is improved. Various studies, involving the pollination of both species of canola in various parts of the world as well as in Manitoba show that, in general, seed yields are significantly higher when honey bees are present in a field. It is also important to note that at present, bees are necessary for hybrid canola production.

FERTILIZER

Canola responds well to fertilizer but high application rates are necessary for maximum yields. A crop of 1960 kg/ha (35 bu/acre) will remove 123 kg/ha (110 lb./acre) of nitrogen; 52 kg/ha (46 lb./acre) of phosphorus; 90 kg/ha (80 lb./acre) of potassium and 24 kg/ha (21 lb./acre) of sulfur. Soil should first be tested to obtain an accurate fertilizer recommendation. Soil testing services are available from

Manitoba Agriculture Soil Testing Laboratory, Agricultural Services Complex, University of Manitoba. For more information, contact the lab or your agricultural representative.

Once soil has been tested, follow these application recommendations:

Nitrogen — Canola tolerates very little nitrogen placed with the seed. Not more than 7 kg/ha (6 lb./acre) should be placed with the seed.

Phosphorus — A maximum of 20 kg/ha (18 lb./acre) of phosphorous should be placed with the seed. Additional requirements should be sidebanded.

Potash — Place all potash away from the seed to avoid seed injury. The addition of potassium is often necessary in sands and sandy loam soils.

Sulphur — Sulphur deficiency is often found on well-drained sandy soils and grey luvisol (grey wooded) soils. At times, other well-drained soils may also be deficient. Canola requires more sulphur than cereal crops for successful production. Poor yields are frequently reported when canola follows alfalfa, which is a heavy user of sulphur.

If a soil test has not been obtained, consult the "Field Crop Production Guide for Manitoba" published by Manitoba Agriculture for general fertilizer recommendations.

Wild mustard in canola

WEED CONTROL IN CANOLA

Weed competition reduces canola plant growth and leaf area, resulting in reduced flower, pod and seed set. Weeds can also cause:

- delayed swathing and combining from hard-to-pick-up swaths, plugging and higher seed moisture content
- increased heating and spoilage from green weed seeds in storage
- increased dockage with higher cleaning and transportation costs

- reduced grades and quality from inconspicuous, inseparable weed seeds such as wild mustard.

Controlling weeds in canola requires good crop management techniques combined with appropriate herbicide selection.

Practices that promote dense, vigorous stands will reduce yield losses due to weeds. These practices include: optimum seedbed preparation; optimum planting rate, date and depth; use of healthy, clean seed; adequate fertility and disease protection.

HERBICIDE SELECTION

Herbicide selection should be based on the weed spectrum present in the field. Choose the most effective registered product from the current "Guide to Chemical Weed Control." A brief summary of products currently available is included following this section. Consult the "Guide to Chemical Weed Control" for the latest product recommendations, and the product label for specifics on application.

Canola is extremely sensitive to broadleaf herbicides such as 2,4-D, MCPA, Banvel and Refine. Be sure sprayers are thoroughly cleaned before applying herbicides to canola. Both the herbicide label and the Manitoba Agriculture publication "Field Sprayers" contain detailed instruction on cleaning sprayers.

WILD MUSTARD CONTROL

Bladex L (post emergence) — Use only on triazine tolerant canola; this product will kill other varieties. Controls wild mustard, stinkweed, shepherd's purse, wild buckwheat, chickweed, cleavers, hemp-nettle, lamb's quarters, annual smartweed species and red root pigweed. (Can be tank mixed with Excel, Fusilade and Poast.)

Sencor (post emergent) — Use only on triazine tolerant canola; this product will kill other varieties. Controls wild mustard, stinkweed, ball mustard, chickweed, hemp-nettle, lamb's quarters, annual smartweed species and red root pigweed.

Sencor + Treflan or Rival (preplant incorporated) — Use only on triazine tolerant canola varieties. Controls wild mustard, stinkweed, ball mustard, hemp nettle, lamb's quarters, annual smartweeds, red root pigweed, cow cockle, Russian thistle, green and yellow foxtail and barnyard grass; suppresses wild oats and wild buckwheat.

Muster (post emergent) — The first herbicide registered (1990) for the control of wild mustard and the suppression of stinkweed in regular canola varieties (at the lower rate). Also controls hemp nettle and flixweed (spring seedlings). At the higher rate, muster controls stinkweed and smartweed and suppresses red root pigweed.

CONTROL OF OTHER WEEDS

Soil Applied Herbicides:

Avadex BW (pre-emergence incorporated)

- Apply in spring or fall for wild oat control.

Fortress (pre-emergence incorporated)

- Apply in fall or spring for control of wild oats, and green and yellow foxtail.

Rival/Treflan/Triflurex (pre-plant incorporated)

- Apply in fall or spring for control of green and yellow foxtail (except trifluralin-tolerant green foxtail), chickweed, lamb's quarters, red root pigweed, Russian thistle and several other broadleaf weeds. Suppresses wild oats and wild buckwheat.

Edge (pre-plant incorporated)

- Apply in fall or spring. Controls a similar weed spectrum to trifluralin, but also suppresses kochia, smartweed and hemp nettle. Gives better control of wild oats and wild buckwheat than trifluralin.

Post-emergence Treatments:

Carbyne 2EC - Suppresses wild oats.

Excel

- Controls green and yellow foxtail, wild oats, barnyard grass and volunteer barley.

Fusilade

- Controls wild oats, volunteer cereals, barnyard grass and proso millet; suppresses quackgrass.

Fusilade + Poast

- Controls wild oats, volunteer cereals, and green and yellow foxtail.

Hoe-Grass 284

- Controls green and yellow foxtail, barnyard grass and wild oats.

Lontrel

- At higher recommended rates, controls Canada thistle, scentless chamomile and wild buckwheat, and suppresses top growth of sow thistle.

  At lower recommended rates, suppresses Canada thistle. (Can be tank-mixed with Poast, Excel, Fusilade and Hoe-grass.)

Poast

- Controls green and yellow foxtail, barnyard grass, proso millet, wild oats, volunteer cereals; suppresses quackgrass.

TCA

- Controls green and yellow foxtail.

INSECT PESTS OF CANOLA

Several insect species may cause economic damage in canola. These are the most important:

Flea Beetle — This insect is the most important pest of canola in Manitoba. Flea beetles are small and active, about 2 mm (1/2 in.) in length and dark in color.

The most serious damage occurs when canola is attacked in the seedling stage. The beetles chew tiny holes in the leaves of newly emerged plants, giving a "shot-hole" appearance. Heavy infestations can severely damage or destroy seedling crops.

Although much less common, heavy flea beetle populations may also cause severe pod damage to mature crops late in the growing season, possibly reducing both yield and quality.

Newly emerged crops can be protected by seed dressings containing lindane, or in-furrow granules containing Counter or Furadan. In-furrow granules provide the best results. Seedlings should be sprayed if flea beetles destroy more than 25 per cent of the leaf surface. Rapid action is required at this point if hot dry conditions are favoring the flea beetles.

Bertha Army Worm — An occasional pest in Manitoba, occurring in outbreak numbers in 1971-72 and in lesser numbers in 1980. The most serious damage occurs on mature crops in early August, when larvae may cause severe pod damage. The larvae darken in color as they grow. Fully grown worms are 35 to 40 mm (1 1/4 to 1 1/2 in.) long and blackish with white stripes.

Control measures should be taken when larvae numbers exceed 20 to 30 per m^2 (2 to 3 sq. ft.) and when pod damage is noted.

Diamondback Moth — Infestations are rare in Manitoba, although a serious outbreak did occur in 1988. Outbreaks only occur with a combination of early-season hot weather and strong south winds, which bring in fresh invasions. The pest does not over-winter in Manitoba. The larvae are very active, pale green caterpillars, about 8 mm (1/3 in.) long when fully grown. They feed on leaves and flowers and may completely strip plants when infestations are severe. Under normal growing conditions, economic damage will not occur until larvae populations exceed 300/m^2 (30/sq. ft.).

Lygus — Lygus bugs cause significant damage on alfalfa seed crops. Work at Agriculture Canada, Winnipeg has found damage to canola as well, with significant yield loss in some fields. Economic thresholds have not yet been determined, so no recommendations for control measures currently exist. The "Manitoba Insect Control Guide" should be consulted for information on this pest in future.

Note: For complete information on recommended insecticides, rates and application methods, consult the "Manitoba Insect Control Guide" published by Manitoba Agriculture. Always follow label instructions when using insecticides.

DISEASE CONTROL IN CANOLA

The incidence of disease in canola has climbed with increased production. Crop rotations must be planned carefully to prevent disease outbreaks. Canola should not be produced more often than one in four years on the same field to reduce disease problems. When rotating avoid other crops susceptible to the same diseases.

Fungiside spraying for white mould control

Common canola diseases and their control measure include:

Sclerotinia Wilt or Stem Blight *(Sclerotinia sclerotiorum)* — Wilting of the plant, bleaching of the stem and premature death are characteristics of this disease. The bleached stems tend to shred, breaking at the base. When stems of infected plants are split open, a white mold growth and hard, black, oval sclerotia bodies are present. These sclerotia can survive in the soil for a year or more. High plant populations favor the development of this disease. The aerial form can infect individual plant branches following the blossom stage.

Sclerotinia stem rot can be controlled by applying the fungicide Benlate or Rovral at the early blossom stage, but the decision to spray canola with Benlate or Rovral must be made prior to any appearance of stem rot disease in the field.

Plants should be sprayed in the 20 – 30 per cent blossom stage at the recommended rate of the fungicide.

Weather conditions prior to and following the 20 – 30 per cent blossom stage will determine the extent of sclerotinia development. Continued wet weather in late June and early July for a period of at least 10 days is required to allow for the germination of the sclerotia in the soil and release of ascospores.Producers contemplating spraying should check the weather forecast for the two to three weeks following the anticipated spray date. If wet weather is predicted there will be much greater risk of disease than if dry weather is forecasted.

Spraying should be considered if the field has a previous history of sclerotinia stem rot, if the disease was prevalent in the area in the previous two years, and if weather conditions in the two to three weeks prior to flowering have been wetter than average. Only fields with a yield potential of at least 2,240 kg/ha (40 bu./acre) should be considered for a fungicide application. Yield responses to fungicide applications are usually better with Argentine varieties of canola than the Polish varieties.

Sclerotinia also occurs in soybeans, sunflowers, mustard, lentils, field peas, field beans, fababeans, sweet

clover, alfalfa and some vegetable crops. Avoid these crops in the rotation. Control of susceptible weeds such as Canada thistle, false ragweed and wild mustard will help minimize losses. Cereal grains and grasses are resistant to this disease.

White Rust or Staghead *(Albugo cruciferorum)* — The first sign of this disease is white spores on the underside of leaves. As the plant matures, the tip of the flower stalks becomes enlarged, producing spiney structures resembling a staghead. Under cool, moist conditions, white masses of spores may also appear on the staghead surfaces. These later turn brown. Overwintering spores are formed inside the stagheads on Polish varieties. Canola or mustard should not be grown on, or adjacent to, land that produced these crops in the previous year. Control of wild mustard or related weed species also reduces the possibility of infection. Check the "Field Crop Variety Recommendations for Manitoba" for information on resistant varieties.

Downy Mildew *(Peronospora parasitica)* — This disease may occur in association with white rust, particularly under cool, moist weather conditions. Symptoms include white mealy or downy mildew growth on the underside of leaves and the staghead surface. Control measures are the same as for white rust.

Alternaria Black Spot *(Alternaria brassicae)* — Symptoms usually consist of small grey to black spots on the leaves, stems and pods. Yield reductions of up to 20 per cent can result from seed shrinkage and premature splitting of the pods. Well cleaned, disease-free seed is important protection in localities where the disease is found. Preferably, seed should be purchased from a source outside the area. Proper spacing of canola crops in the farm rotation is important as well. Early swathing can minimize losses in badly infected crops. Controlling weeds of the mustard family will also reduce its occurrence.

Blackleg *(Leptosphaeria maculans)* — Blackleg is a very serious disease in parts of western Manitoba and is spreading east. The number of fields infected with blackleg increase each year. Leaf and stem infection develops in early summer during the seedling and rosette stages. Leaf lesions are round to irregular in shape, whitish in color and dotted with small black spots. The stem lesions form elongated cankers which may completely girdle the stem, causing premature ripening, shattering and shrivelled seed. Plant breeders are trying to increase the blackleg resistance of new varieties. For the reaction of recommended varieties to blackleg, consult the "Field Crop Variety Recommendations for Manitoba."

Seed treatment is essential. Do not purchase seed originating from areas known to have blackleg. Seed treatments also control seed rot, seedling blight and flea beetles. Keep to a strict rotation at all times.

If blackleg is identified, all crop residue should be buried and the field kept out of canola production for at least four years. If possible, canola should not be grown in adjacent fields for three to four years.

Aster Yellows — Plants infected with this disease produce small green, round or elongated seedless bladders rather than normal pods at the plant's tip. Pods on the lower portion of the plant may look normal but fail to set seed. Aster yellows is spread by the six-spotted leafhopper. Severity of infestation varies from year to year depending on leafhopper populations in the crop. There are no practical control measures for this disease.

WINDROWING AND HARVESTING

Canola shatters easily when ripe. To avoid economic loss form shattering, cut canola while the pods are still green.

Seed color, not pod color, determines the correct time to windrow. Collect seed samples from several locations within the field, and from the top, middle and lower parts of the main stem. Mix the seed samples to determine the degree of color change.

Begin windrowing when 10 to 20 per cent of the seeds show partial or complete color change (reddish brown to black for most varieties, and reddish brown and/or light yellow for Polish varieties). At this stage most seeds will still be green. Remember, canola takes longer to mature in the windrow than wheat. Unlike cereal crops, some moisture on the swath will not cause problems. In fact it may well be beneficial, ensuring more green chlorophyll is removed from the seed. When rolled between the thumb and forefinger, most seeds should feel firm and not break. Average moisture at this stage is about 35 per cent.

Cut the crop just below the lowest pods to minimize the amount of excess material in the windrow. High stubble will allow the windrow to settle, preventing it from being blown by high winds. It also enables the pick-up to run below the windrow to reduce shelling.

To prevent wind damage, use a light roller to anchor the windrow in the stubble. Excessive pressure produces a windrow too compact to dry quickly and does not allow the pick-up to run below the windrow.

A smooth, even flow of material is important to achieve uniform windrows. In heavy or lodged crops a pick-up reel can help reduce bunching of the windrows.

Windrowing canola

To prevent problems at the divider, modifications to the windrower are often required. One method is to extend the divider rod well ahead of the cutterbar. This forces the crop down so the actual dividing is done by the cutterbar as the crop is cut. Commercial attachments are available which cut vertically through the crop material. These attachments generally work very well, keeping losses to a minimum and reducing bunching of the windrow.

To prevent excessive loss from pod shattering, use a belt or draper type pick-up. Pick-up speed should closely match the ground speed. The cylinder speed required to thresh canola is usually one-half to three-quarters the speed needed for wheat. The optimum cylinder speed depends on the condition of the crop. It should be set fast enough to do a complete threshing job, but not so fast that it breaks up the straw, overloading the sieves and causing high sieve losses. Concave clearance should be wide enough to prevent excessive straw break up.

COMBINE ADJUSTMENTS

Overthreshing at the cylinder/concaves is a common problem when combining canola. This can cause cracked kernels, high dockage and excessive loading of the shoe with broken stems and pods, leading to unacceptable losses. The following ranges are recommended for initial settings. Further adjustments will usually be required to suit field conditions.

- Set cylinder speed between 400 and 800 rpm.
- Set concave clearances of 10 to 20 mm (3/8 to 3/4 in.) at the front and 5 to 10 mm (3/16 to 3/8 in.) at the rear.
- Start with a chaffer setting of 8 to 10 mm (5/16 to 3/8 in.) and a lower sieve setting of 3 to 5 mm (1/8 to 3/16 in.).
- Set the fan speed to approximately three-quarters of the speed used for wheat. The shutters should only be closed if the air volume cannot be reduced enough by decreasing the fan speed.
- Set the windboards to produce a uniform airflow over the entire sieve area.

Canola is easily blown out the back of the combine. It is better to shake the seeds out of the chaff than to blow the chaff out of the seed. However, be sure to use sufficient airflow to maintain a "live" sieve.

The bottom sieve should be set to minimize the quantity of return. Open the sieve until an excess amount of trash appears in the grain tank, then close slightly. A round hole sieve about 4 mm (1/8 in.) in diameter may produce a cleaner sample without overloading the tailings return.

Check the combine for any leaks. Even small leaks can cause significant losses.

DESSICATION

Aerial application of a dessicant such as diquat (Reglone) may be used to ripen standing canola. The dessicant also kills most weeds in the crop and speeds harvest.

Be sure to take samples from the field before applying a dessicant so ripeness can be checked. 60 to 75 per cent of the seeds should be in the greenish-red to brown and/or yellow stage depending on variety, and not more than 40 per cent should be completely green.

Direct combining of Argentine varieties is not recommended. These should be windrowed three days after diquat is applied. Polish varieties may be direct combined within 14 days of dessicant applications or if not dessicated, when ready to thresh.

STORAGE AND DRYING OF CANOLA

Safe storage of canola requires considerable care and attention. The causes of spoilage in canola are the same as for cereal grains, namely:

- high seed temperature
- high moisture content
- lack of aeration
- exposure to damp weather before harvesting
- broken seeds

The most important spoilage factor is the relationship between temperature and moisture content. Allowable storage times are listed in Table I.

Presuming a moisture content of 10 or even nine percent is "safe" has led to spoilage of many tonnes of canola. Canola should be cooled down as quickly as possible after harvest, and eventually cooled down at least

Ensure canola is dry for safe storage

to 5°C (41°F) for winter storage, even when harvested at moisture contents of less than nine per cent. Recommended aeration procedures are as follows:

- Direct the fan to blow air up through the canola.
- Start the fan as soon as canola is put into the bin and let it run until the top is cooled down to the average daily temperature.
- When the average daily temperature drops by 10°C (18°F), start the fan again and cool the canola to the new temperature. Repeat this process until all canola is down to near 0°C (32°F).
- Check stored canola at least once a week.

TABLE I: ALLOWABLE STORAGE TIME FOR CONTINUOUSLY VENTILATED CANOLA

Temperature	Moisture Content				
	8%	10%	12%	14%	16%
25°C (77°F)	90 days	30 days	10 days	5 days	-
15°C (59°F)		90 days	20 days	6 days	-
5°C (41°F)			75 days	25 days	10 days

If moisture content at harvest is too high for safe storage, a heated air dryer may be used. Several precautions must be observed:

i) Use a safe drying temperature. Recommended maximum temperatures are shown in Table II.

If the dryer exposes seed to hot air for long periods of time (such as a non-recirculating batch dryer), reduce the above temperatures by 5 to 10°C (10 to 20°F).

Many dryers have inaccurate temperature sensors, so it is essential to install at least one extra thermometer in the hot air plenum as a check on the sensor provided with dryer.

ii) Do not over-dry. Over-drying increases the likelihood of heat damage. It also costs more time and money to dry the seed, and causes unnecessary weight loss. A final moisture content of eight per cent is low enough if proper cooling is provided.

iii) Cool the canola down to within 5°C (10°F) of the ambient air temperature. This can be done in the dryer, or better still, in an aerated bin. If canola is cooled improperly, excessive moisture will migrate in the bin, and spoilage may occur even though the canola has been dried. Use the aeration procedures outlined previously.

More information on dryer types and operation is contained in the publication "Heated Grain Dryers."

Small wooden storage bins are considered by some to be a cure-all for all canola storage problems, but this is not the case. Total crop spoilage can occur within two weeks in such storage. Since canola deteriorates very quickly once heating starts, storage must be checked often. The most reliable storage method is a bin equipped with a properly designed aeration system that is operated correctly.

TABLE II: MAXIMUM DRYING TEMPERATURES FOR CANOLA		
Initial Moisture Content	**Seed**	**Commercial**
Above 15%	45°C (113°F)	60°C (140°F)
Below 15%	50°C (122°F)	70°C (158°F)

QUALITY AND GRADING

The most critical quality factor for canola is the amount of green seed. Tolerances for "distinctly green" seed are shown in Table III.

The other main grading factor is the admixture of inconspicuous seeds (usually wild mustard). Maximum levels of five per cent seem high, but in a field even moderately infested with wild mustard, contamination can be a problem. Choosing a field known to be relatively free from wild mustard is therefore very desirable.

Price discounts can be considerable if canola does not make the top grades. For maximum return, the crop must be managed with great care from the time the field is chosen through seedbed preparation, seeding, cutting and harvesting. The availability of new herbicides for wild mustard control should help alleviate the admixture problem.

Weather problems during the maturation period may lead to increased levels of green seed. The greatest danger is from frost, which can lock chlorophyll into seeds before they fully mature. Hot, windy weather can cause seeds to dry down so rapidly in the swath that removal of the chlorophyll is not complete before the seed is dry. In hot conditions it may be better to swath a little later than normal to allow the seeds maximum access to moisture from the stems.

Determination of green seed in canola

Table III: CANOLA (CANADA) – PRIMARY GRADE DETERMINANTS – (Abridged)**					
		Maximum Damage			
Grade	Soundness	Heated	Distinctly Green	Total	Inconspicuous Admixture*
No. 1 Canada	Reasonably well matured, sweet, of good natural color	About 0.1%	2.0%	3.0%	5.0%
No. 2 Canada	Fairly well matured, sweet, reasonably good natural color	About 0.5%	6.0%	10.0%	5.0%
No. 3 Canada	Natural odor associated with low quality seed, but not distinctly sour, etc.	2.0%	20.0 %	20.0%	5.0%

* Inconspicuous admixture, usually wild mustard. (Over 5.0% up to 50%, grade canola, sample account admixture. Over 50.0%, grade refuse screenings.)

** For complete grade table consult Canadian Grain Commission Grain Grading Handbook

SOURCES OF ADDITIONAL INFORMATION

- **Field Crop Variety Recommendations for Manitoba**
  (Published annually by Manitoba Agriculture)
- **Field Crop Production Guide**
  (Published every three years by Manitoba Agriculture)
- **Guide to Chemical Weed Control**
  (Published annually by Manitoba Agriculture)
- **Manitoba Insect Control Guide**
  (Published annually by Manitoba Agriculture)
- **Canola Growers' Manual**
  (Published by the Canola Council of Canada, Winnipeg; updated as required)
- **Canada's Canola**
  (Published by the Canola Council of Canada)
- **Canola Oil — Properties and Performance**
  (Published by the Canola Council of Canada)

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